STATE OF ILLINOIS
DWIGHT H. GREEN, Governor

TRANSACTIONS
OF THE
ILLINOIS STATE ACADEMY OF SCIENCE

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Memoirs

EDITED BY DOROTHY E. ROSE

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STATE OF ILLINOIS
DWIGHT H. GREEN, *Governor*

DEPARTMENT OF REGISTRATION AND EDUCATION
FRANK G. THOMPSON, *Director*

ILLINOIS STATE MUSEUM DIVISION
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In addition to current officers, the Academy Council for 1943-44 includes the two most recent past presidents: F. M. Fryxell, Augustana College, Rock Island, T. H. Frison, Illinois Natural History Survey, Urbana, and the past secretary, R. F. Paton, University of Illinois, Urbana.

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ANNOUNCEMENTS

Attention is directed to the fact that the Committee on Research Grants of the Illinois State Academy of Science has at its disposal a small sum of money to be disbursed in support of worthy research projects. Applications for grants will be accepted up to and including March 31, 1944. It is customary to give preference to scientists connected with the smaller institutions of the state.

Requests for grants should be accompanied by a brief statement of the training and experience of the applicant, the purpose of the investigation, and the estimated cost. Previous publications should be listed. At least two letters of recommendation should be transmitted directly by their authors. Correspondence may be addressed to L. H. Tiffany, Northwestern University, Evanston, Illinois.

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Kenneth R. Coe Biological Co., 2024 Sunnyside, Chicago.
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1944 MEETING: DEKALB, MAY 5-6

AMERICAN SCIENCE IN THE PHILIPPINES

F. M. Fryxell

Retiring President of the Illinois State Academy of Science

The independence long and ardently ought by Philippine patriots for their land country was all but a reality hen, in December 1941, the Japanese unched the ruthless campaign of ggression that shattered this aspira- on along with unnumbered others. n the normal course of events, opera- ion of the Tydings-McDuffie Act (the Philippine Independence Act") would n July 4th, 1946 amicably and legally ave severed the slender political ties hich still linked the Philippines to the nited States, but these were now vio- ently and prematurely ruptured. This agic situation brings urgently to the ore the question of our future rela- ions to the Philippines, a question hich can be considered only in the ght of past events.

If imperialistic design played any art in our acquisition of the Philip- ines, as has been charged, our coun- y's long-range program for the is- ands, as clarified almost immediately fter the ratification of the peace treaty ith Spain (in Senate Resolution of ebruary 14, 1899) was anything but mperialistic:

". . .it is not intended to incorporate the inhabitants of the Philippine Islands into citizenship of the United States, nor is it intended to permanently annex said Islands as an integral part of the territory of the United States; but it is the intention . . . to establish on said Islands a government suitable to the wants and conditions of the inhabitants . . . , to prepare them for local self-government, and in due time to make such disposition of said Islands as will best promote the interests of the citizens of the United States and the inhabitants of said Islands."

Retiring President of the Illinois State Academy of Science, now on leave from Augustana College, Rock Island, Illinois, for war work as geologist with the unit of Military Geology, U.S. Geological Survey, Washington, D. C.

AMERICAN STEWARDSHIP

Thus at the outset we acknowledged ourselves the temporary stewards of this nation, and committed ourselves to a program unique in its altruistic purpose and high objectives.

What then, after the lapse of more than four decades, can be said of our stewardship; was it good? One answer to this question, perhaps the most convincing of any, was given by the Filipinos themselves in the dark months after Pearl Harbor, when 20,000 of their finest young men perished fighting side by side in common cause with our own American soldiers, in a demonstration of loyalty so unflinching that the President of the Commonwealth, with just pride, characterized it as without parallel not only in the Orient but in the history of colonialism. None of us are likely ever to forget it. Such loyalty to the American cause appears all the more significant when we recall that four decades ago these same people viewed us as the aggressors, and with equal courage resisted us. Our stewardship could not have been altogether unwise to beget so revolutionary a change in so brief a period. In the last analysis the truest judgment of a nation's colonial policies may be that which history pronounces with the governed themselves as its spokesmen. At Bataan the Philippine people translated into deeds the words earlier spoken by Manuel Quezon when, at his inaugural as first president of the island republic, he said, "The Philippines look back with gratitude to the day when destiny placed the land under the beneficent guidance of the United States."

Americans, too, have an answer, and their concensus is that "the Philippine experiment", our only major venture

in colonial administration, was a brilliant success, providing a page in history we may regard with special pride. For all of the presidents of the United States, regardless of party affiliations, have scrupulously adhered to the original statement of policy with respect to the Philippines. As their representatives to the Islands, the presidents have assigned a succession of exceptionally able statesmen, men like William Howard Taft, Leonard Wood, Frank Murphy, and Francis Sayre, who on the opposite side of the world in turn devotedly undertook to lead a foreign people into modern ways of thought and life. Granted that the experiment involved much typical American trial-and-error, by and large it was a "beneficent guidance".

RÔLE OF SCIENTISTS

I do not propose to review in detail the Philippine record, as that has been ably done by others,[1] but I shall give thought to one aspect of it that impressed me greatly during a year's sojourn in the Islands in 1939-1940. I have reference to the fact that the remarkable development of the Philippines during the American regime would not have been possible except for the active participation of American scientists in the work which our government undertook in the Islands.

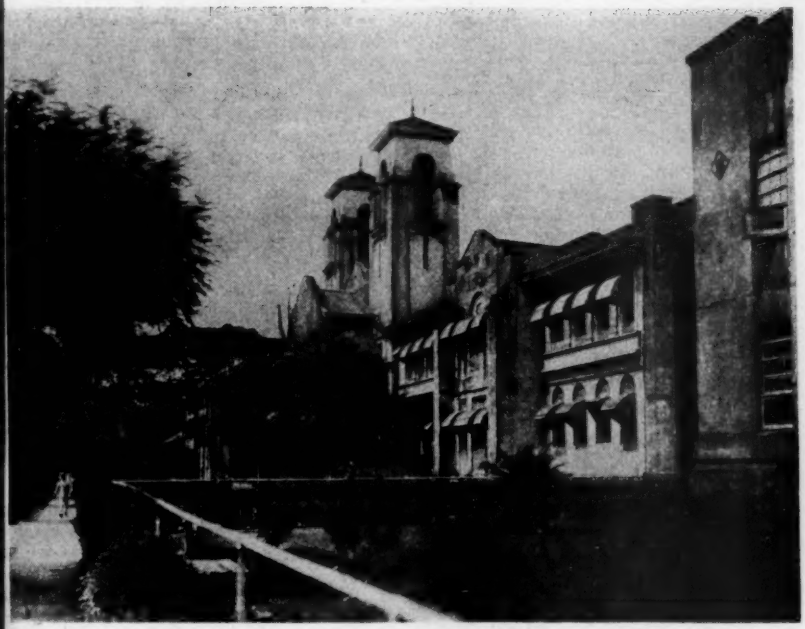
This participation had its origins early. On January 20, 1899, while military control was still far from complete throughout the Islands, President McKinley appointed a committee of five men (two military and three civilian members) to investigate critically and first hand the Philippine situation. This "First Philippine Commission" duly submitted a comprehensive and scholarly report embodying information and recommendations that proved highly significant in determining subsequent policies. One of the dominant members of this Commission, and the principal contributor to its report, was a scientist, Professor Dean C. Worcester, zoologist of the University of Michigan, whose years of previous exploratory work in the Philippines had given him unequalled knowledge concerning the Islands.[2] To Dean Wo cester must be given much of t credit for the marked degree to whi modern science was enlisted to ser humanity in the Philippines.

On April 7, 1900, McKinley appoint the Second Philippine Commissio similarly consisting of five membe (all civilians). Membership includ William Howard Taft, chairman, a again Dean C. Worcester, only memb carried over from the First Commissi This Commission was assigned t great responsibility of actually setti up a civil government, one whi would contribute to "the happine peace, and prosperity of the people On July 4, 1901, when Mr. Taft a sumed full control of the Philippin as first civil governor, the other fo members of the Commission became d partmental heads under him.

Through these circumstances, Dea C. Worcester became the first Secreta of the Interior of the Islands, and mo of the scientific divisions of the go ernment—specifically those concern with public health, scientific labo atories, national forests, public land agriculture, fisheries, mining, weath service,[3] quarantines, and the admi istration of the pagan mountai tribes—came to be organized by a ma who combined scientific training wi exceptional administrative ability an constructive imagination. Worcest continued as Secretary for twel years, his tenure of office greatly e ceeding that of any other member the Commission. A man of stron convictions, extraordinary vitality, an vigorous action, he was not without h complement of enemies, but his leade ship in organizing the scientific age cies of the Philippine governme during the critical early years of t American administration is now reco nized as having been as capable an far-seeing as it was fearless.

BUREAU OF SCIENCE

Worcester's university experien led him to oppose duplication an scattering of effort, and his insisten on centralization led to establishme of the Bureau of Government Labo atories, which in 1905 united with t



Bureau of Science, Manila
(Courtesy of the Division of Territories and Island Possessions, Department of the Interior.)

Bureau of Mines to become the Bureau of Science. A colleague of that period, Dr. Victor G. Heiser, states[4] that Worrester's greatest achievement was to "assemble under one administration, as far as practicable, all the scientific work of the government, building up in one unit the most modern organization in the laboratory field that any country has evolved."

We need not trace the later history of the Bureau of Science and other scientific units of the government, except to remark that despite some unfavorable changes, consolidation and collaboration have continued to characterize scientific work in the Islands to a remarkable degree, and have justified themselves by a distinguished record of achievement. The plan of a centralized "Bureau of Science" has attracted the attention of other governments, and provided them with a convincing example of the practicability of such an organization.

The constructive interest of President Theodore Roosevelt in scientific aspects of the Philippines during these early years is indicated in a letter dated February 7, 1905, to the Senate and House:

> "Circumstances have placed under the control of this government the Philippine Archipelago. The islands of that group present as many interesting and novel questions with respect to their ethnology, their fauna and flora, and their geology and mineral resources as any region of the world. At my request the National Academy of Sciences appointed a committee to consider and report upon the desirability of instituting scientific explorations of the Philippine Islands . . . The surveys . . . should be undertaken as a national work for the information not merely of the Philippine Islands, but of the people of this country and of the world. Only preliminary explora-

tions have yet been made in the archipelago, and it should be a matter of pride to the Government of the United States fully to investigate and describe the entire region."

Scientific explorations of the type recommended by Theodore Roosevelt, so clearly reflecting the personal interests of this president, were in due time carried out largely through the various divisions of the Philippine Bureau of Science.

PIONEER RESEARCH

To the Americans who comprised the early scientific staffs in the Philippines, the opportunities for pioneer research in the Islands provided a thrilling venture. The great archipelago, comprising over 7,000 islands extending north and south through the tropics a distance of nearly 1,200 miles, has a land area of about 115,000 square miles, an area comparable to that of Japan, of the British Isles, or of Italy. The flora and fauna of the islands and the surrounding waters are indescribably rich, and no less attractive are the opportunities for research in such fields as anthropology, ethnology, and tropical medicine. In the study of this vast scientific field, beginnings had been made during the Spanish period, but little systematic research of the type launched by American workers a few years after the turn of the century. Their investigations, pursued year after year and based on data that became increasingly comprehensive, eventually led to publication of monographs like those of E. D. Merrill, W. H. Brown, and H. N. Whitford on the flora; by E. H. Taylor on the vertebrate fauna; by R. C. McGregor on the bird life; and by H. O. Beyer on the ethnology of the Islands. Other studies dealing with infant mortality, malaria and various tropical diseases like dengue fever, sanitation, fisheries, city water supplies, geology and mining, forestry, problems of plant and animal husbandry, and additional subjects too numerous to list, reflect the many-sidedness of the scientific program. Directed by Americans up to the middle '30's, with the establishment of the Philippine Commonwealth these programs were largely taken over and continued by Filipinos who had been well trained for such responsibility.

A statement[5] by E. D. Merrill concerning achievements in botanical endeavor may be taken as representative for other scientific fields as well:

> "In the period 1902 to 1923 . . . Manila has been made a center of botanical research for the Philippines, and one of the few productive centers of research in Asia and Malaysia . . . At the present time this rich flora is better known than is that of any other part of the entire Malaysian region, except Java and parts of the Malay Peninsula. This advance has been made possible only by the wise policy of centralization of scientific work adopted by the Philippine government, cooperation between existing units, and the granting of the necessary financial support by the government."

Inevitably the progress in investigations of this type was accompanied also by the healthy growth of related activities such as the development of scientific libraries, museums, and botanical gardens, but to give an account of these would lead us far afield.

PUBLISHED REPORTS

In 1906 was established the Philippine Journal of Science, under editorship of Dr. Paul C. Freer. The official publication of the Bureau of Science and hence supported by the government, this Journal continued for 35 years to provide a channel of publication for all phases of scientific work particularly the research of the many specialists brought to the Islands for the government and university staffs. The advantage of combining within the covers of a single journal the greater part of the country's scientific literature has been gratefully acknowledged by many workers. Up to the fall of 1941, when Japanese invasion of the Islands presumably terminated publication, no less than 75 volumes of the Journal had been issued. Filling many library bookshelves, these volumes give monumental testimony to the wholesome vigor with which scientific research flourished during the American

Mayon, altitude 7,943 feet, south end of island of Luzon. Most famous Philippine volcano and one of the most perfect volcanic cones known. Established as a national park in 1938.

(Courtesy of the Division of Territories and Island Possessions, Department of the Interior.)

decades. One of the most interesting features of the Philippine Journal of Science is the fact that Volume 1 is almost exclusively the product of American authors, whereas Volume 75 is almost exclusively the product of Filipino authors. Through the intervening volumes one may trace the stages by which American scientists prepared their Philippine colleagues for scientific independence.

EXPEDITIONS

This rapid survey permits only passing mention of the expeditions sent to the Philippines by such institutions as the U. S. National Museum, the American Museum of Natural History, the Field Museum, and various universities. These have contributed greatly to our knowledge of the Islands, especially in ethnology and anthropology. We recall in this connection that some of the most important ethnologic investigations were made by a member and former president of this academy, Dr. Fay Cooper-Cole, who in 1907-1909 headed expeditions of the Field Museum to Luzon and Mindanao under sponsorship of Robert F. Cummings of Chicago.[6] On one of these expeditions, a scientist of the Field Museum staff, Dr. William Jones, met death in northern Luzon at the hands of hostile tribesmen, Ilongots.

COASTAL SURVEYS

Similarly I can only allude to the program of charting Philippine waters which was begun by the U. S. Coast and Geodetic Survey in 1901, and only in recent years has neared completion. In 1939, the third census of the Philippine Islands taken during the American regime furnished occasion for the publication of a monumental atlas,[7] by far the most complete and authentic work of its kind dealing with the Islands. Fortunately a few copies of this atlas reached the United States before the Japanese captured Manila, so our country is not wholly deprived of the use of this all but indispensable work.

NATURAL RESOURCES

Among a people as predominantly agricultural as the Filipinos, an obvious field for "science in the service of the people" lay in the improving of their farm stock and crops, and in seeking new agricultural products suited to the soil and climate of the Islands. In these fields also notable progress has been made, and to review the activities of the Bureaus of Plant and Animal Industries in the Philippines would be to outline the work of our own Department of Agriculture, as adapted to the needs of this tropical country.

These have been decades during which conservation of natural resources has come to loom ever larger in our national thought and planning. It was but natural that Americans carried with them to the Philippines the philosophy of conservation and wove it into the fabric of insular life and government. As a result, the superb tropical forests of the Philippines, that cover over 68,200 square miles or about 60 percent of the total land area of the Islands, and that includes some of the finest commercial woods in the world, are 97.5 percent under government control. No feature of the Philippines impressed this speaker more deeply than the somber splendor of the vast rain forests. The knowledge that these were being administered in accordance with wise forestry practice[8] and for the benefit of future as well as present generations was truly gratifying.

The Bureau of Forestry has charge not only of the country's forests but also of a system of National Parks, much like our own, including in 1940, 26 different parks, with a combined area of 647 square miles. Establishment of these parks represented the first steps in a program intended ultimately to preserve for public enjoyment and inspiration, in their primitive state, all of the finest scenic areas of the Philippines, as well as areas of unusual scientific and historic significance.

In fish, game, and wild-life conservation, control of mineral resources, and the combating of soil erosion, substantial progress has been made, and in the normal course of events much greater results could have been confidently anticipated. Soil erosion is a particularly serious problem in these islands, where the heavy rainfall, which in places amounts to as much as 180 inches a year, ravages the deep mantle of tropical soil wherever it is unprotected.

One of the most noteworthy developments of recent decades and one in which science has played a fundamental part has been the spectacular rise of the Philippine mining industry.[9] Prior to 1907 Philippine mineral production was not even listed in statistical records as a minor industry. By 1938 mining ranked second only to sugar production, and the Secretary of Agriculture and Commerce could predict that the time was not distant when mining would displace sugar as the premier industry. In this phenomenal record, gold played the leading part, the production rising rapidly till in 1939 the Philippines ranked fifth among the gold-producing countries of the world, surpassed only by South Africa, Canada, the United States, and Australia. In American territory the Philippines ranked second only to California. Since 1907 the islands have produced more than $250,000,000 in gold.

Systematic geologic investigation led also to the discovery of important deposits of base metals and non-metallic minerals, and recent years have seen a striking expansion in the production of these materials, which, incidentally, were purchased largely by Japan. Of the total value of the 1938 production, iron made up 36 percent, copper 18 percent, chromite 14 percent, manganese 9 percent, and non-metallic minerals 23 percent. Doubtless during the past year production of these highly strategic materials has been accelerated by the Japanese.

During 1939-1940 the writer participated in a petroleum survey of the Philippines, conducted for the Commonwealth Government by a staff of American geologists. Prospects for location of significant oil fields were very favorable on certain islands, and exploratory drilling was under way

when the Japanese invaded. Presumably drilling crews and the several geologists still in the Islands were taken prisoners. Among these was Dr. H. Foster Bain, formerly Chief of the Illinois Geological Survey (1905-1909) and a charter member of this Academy. Many other scientists are also being held prisoner at Santo Tomas University, Manila.

EDUCATIONAL PROGRAM

One cannot consider the impacts of American science on Philippine life without reference to the American educational program. A Philippine educational authority, V. R. Catapang, has stated[10] that "There is not, perhaps, in the record of war another example where a conquering power has taken first of all to the teaching of the conquered, but in the very first minute of American occupation of Manila and other parts of the Islands, the American leaders began to deliberate on the pursuit of this grand ideal." The schools of Manila, disrupted by war, were restored to successful operation in two weeks. So began the American effort to make education available to all. From the chaos which war had brought to the Islands emerged a complete system of public schools, with schoolhouses "scattered into every nook and cranny of the archipelago, from the mountain Igorot country down to wild Moro land." The first teachers were volunteers from among the American soldiers. Later American men and women teachers came to the Islands by the hundreds. Not uncommonly the American school teacher, assigned to an isolated barrio on an isolated island, had no other white neighbors within many miles.

It was a leading Filipino citizen of Manila who first emphasized to me that in this effort to achieve universal education our country was embarking on a policy that was new to colonial administration. The results of this ambitious effort have been impressive. For years education in the Philippines has accounted for almost one-third of the government budget. At the time of the Japanese invasion, expansion of the educational work was still vigorously progressing. The total school enrollment was then over 2,000,000. There were almost 11,000 primary schools, over 1,300 intermediate schools, 114 secondary schools, 5 junior colleges, and the University of the Philippines, not to mention the many excellent private schools. Illiteracy had dropped from about 80 percent in 1903 to less than 50 percent in 1939, and within the younger generation one rarely encountered illiteracy. English had largely taken over the place formerly held by Spanish.

The public school system has provided the main channel through which our government has disseminated the all-important principles of sanitation, hygiene, and good health. Modelled too closely after American schools at the outset, the Philippine system gradually became closely adapted to the distinctive needs of the country, placing increased emphasis on vocational training and, particularly, agriculture. In later years agricultural training has been included in the curriculum of even elementary schools. While in the Islands, the speaker found it extremely interesting to examine the many school textbooks which American scientists, residing in the Philippines, had prepared especially for use in the teaching of geography, biology, agriculture, general science, and similar subjects in the Philippine public schools.

For the purpose of giving vocational and citizenship training to older people, in 1936 the office of Adult Education was established, and a splendid beginning was made in offering adult training in gardening and other phases of agriculture, as well as sanitation and homemaking.

Foremost among the higher institutions of learning in the Islands is the University of the Philippines, founded during the American regime in 1908.[11] By reason of its situation in the heart of Manila, the departments of this university, especially its scientific ones, have profited greatly from close cooperation with such government units as the Bureau of Science, whose staff members have in many cases served also on the faculty. Through addition

of college after college, the University gradually developed into a great, complex institution, and a principal center for scientific instruction and research, with modern buildings and facilities, beautiful spacious grounds, a faculty of about 200, and an annual student enrollment of nearly 8,000. It has offered courses leading to degrees in Medicine, Dentistry, Pharmacy, Forestry, Agriculture, Veterinary Science, Engineering, and all the other branches one might expect to find in an institution patterned after the American state university. A frequent visitor to the University of the Philippines in the summer of 1940, I found it difficult to realize I was not back on an American campus. For some years the University has maintained branches at the cities of Baguio and Cebu. In some fields the University has offered graduate work, and in particular it has stressed its facilities for advanced studies in natural science, but many of its graduates have chosen to earn their higher degrees at universities in the United States, where the Philippine graduate student has become a familiar figure. It is of interest to note that in later years the administrative officers and faculty of the university have consisted almost entirely of Filipinos.

PUBLIC HEALTH

It was in the field of public health that the American government made what many would regard as its greatest achievement in the Philippines. This record is one which parallels that made in Panama, in connection with the building of the Panama Canal; but in many respects it is even more remarkable although less generally known. Many names loom large in the conquest of disease in the Philippines —to mention a few, Dean C. Worcester, Paul C. Freer, Richard Strong, Victor G. Heiser, Major Frank S. Bourns, Lt. Col. G. C. Dunham, Col. L. M. Maus, and Governor-General Leonard Wood. Of the pioneering period, 1898 to 1914, Worcester has been called the "leader" and Heiser the "great administrator and field officer". The autobiography[12] of Dr. Heiser, who was Commissioner of Public Health in the Islands from 1905 to 1914, is a dramatic narrative that recounts how the health campaign was vigorously and relentlessly waged along many fronts, often with slow gains that were maintained only through ceaseless vigilance. Dr. Heiser states[13] that when this campaign was begun there was not a good operating room in the Islands, and no laboratory facilities. "To remedy this condition Worcester, in 1900, had formulated a plan on a noble scale to build a hospital, a medical school, and a laboratory of science all in one group—the medical center idea adopted in the United States so much later. . .After eight years of steady pounding he was rewarded with success."

This was one phase of a program that entailed the establishment of smaller hospitals throughout the Archipelago; the training of native doctors and nurses, and their assignment to remote posts on scattered islands; the cleaning up everywhere of contaminated water supplies and other sources of infection; the building of modern waterworks and sewer systems; introduction of a universal and at first free from popular program to educate the populace in sanitary and hygienic principles; wholesale vaccination; the drafting of laws and regulations for the protection of health, including a sanitary code, pure food and drug legislation, laws and regulations governing the teaching and practice of medicine, nursing, dentistry, and pharmacy. In this campaign private organizations, such as Protestant and Catholic missionary groups, cooperated through their schools and hospitals. From 1922 to 1935 the Rockefeller Foundation supported a broad public health program outlined by Dr. Heiser which provided for a graduate School of Public Health and Hygiene at the University of the Philippines, and exchange fellowships which each year enabled more than thirty Filipino doctors to take graduate courses in the United States. The latter provision has been most important in preparing the Filipinos for the responsibility of carrying on for themselves.

Results of the health campaign have been sensational, indeed almost incred-

ple. One after another the fearful epidemics of small pox, cholera, and bubonic plague were brought under control. Smallpox was essentially wiped out. Dysentery and tuberculosis were checked, malaria greatly reduced. Lepers were segregated and given all the help that medical science and humane consideration could provide. Through more balanced diet and general improvement of their well being,[14] the people made notable gains in vigor and resistance to disease. Figures strikingly reflect these changes. The population of the Islands more than doubled during the American period, increasing from less than seven million in 1903 to over sixteen million in 1939. Death rates have dropped—in Manila, for example, from 39 per 1000 in 1904 to 18 per 1000 in 1935. So also infant mortality, which offers the most striking figures of all; in Manila the decrease was from 80 per 100 to 6 per 100.

SUMMARY

Obviously this record of science in the Philippines should not be regarded as something apart from corresponding changes in all the walks of life in this insular country. A recent writer, William H. Haas, has commented[15] that "culturally as well as economically the progress. . .has been little short of phenomenal. Probably no other country can show a similar change. The lawlessness of Spanish days has been replaced by a well-organized government with an efficient constabulary of native soldiers who, through their devotion to duty, have made their country as law-abiding as in any other progressive nation. Where formerly justice was largely a mockery, today courts carry out constitutional guarantees through native judges leaving little to be desired. Besides this, churches, schools, good roads, sanitary control, and the like place the Philippines, the only Christian nation in the Far East, well to the front among nations."

My subject is one that can be pursued indefinitely, but I do not propose to develop it further. This much has been said to establish the thesis, that our country has given a good account of its stewardship of the Philippines, and that in carrying out its role of a "liberating rather than a conquering nation" the American government found in science an indispensable aid.

I have sought to make this point for reasons other than mere academic interest. Through four decades the American Philippine relationship remained as Ralston Hayden puts it, "happier and more fruitful than any other which has existed in modern times between a dominant and a dependent people."[16] But since the fall of Corregidor, the Islands have been cut off from all contact with us, isolated as if on another globe. We can only conjecture concerning the condition of the people, and the fate of institutions that Americans and Filipinos together erected during the years of common endeavor. This much is certain, that when allied victory in the far-off Pacific theatre of war again brings peace and freedom to the Islands, we can expect to find in ruins much that we cherished because it was the expression of our best efforts and our finest national traditions. Who will say that in that day it is not incumbent upon us to take up anew the Philippine program, even if we must start again almost at the beginning?

There are implications even more far-reaching. To predict the future is beyond the ken of any man, but we may assume that in the post-war period toward which we hopefully look, the rehabilitation of crushed and broken nations everywhere will be an obligation, urgent and inescapable, devolving upon those nations like our own that are rich and strong, or have suffered least. When that time comes, it may well be that our government, seeking the pattern for a program which will have for its purpose the aiding of a stricken world, will turn to its Philippine experience and find in it a new and larger meaning than has yet been evident. For if it proves anything, the Philippine experiment demonstrates that the principles of the Atlantic Charter are definitely workable among colonial peoples even

in the most distant corners of the globe.

And undoubtedly, as was the case during the years that followed Dewey's victory at Manila Bay, civilians will again be assigned to take the place of the military, and build a new and better order on the ruins of the old. If history thus repeats itself, this time it may well be on a global scale, and the place of science in the program will be large. I am confident that once again American men of science will join with statesmen, educators, and others in meeting these new responsibilities, accepting their challenge in the same spirit of high adventure that distinguished those colleagues of a generation or two ago, who journeyed across half the world to labor in the Philippines.

In times like these, when on unnu bered battlefields we witness the de astating effectiveness of science wh used for purposes of destruction, w need to recall that science is no le powerful and no less efficient wh used in the pursuits of peace. In its science is neither good nor ev applied in war it can devastate a nati or, in the service of Christian charit it can prove an agency of blessing us to banish fear and pestilence. T choice between such alternatives li with humanity. As a case in point a one that gives us much of hope f years to come, I submit to you t record of American science in t Philippines.

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THE TRUSTEESHIP OF THE NATIONAL PARK SERVICE

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FUNDAMENTAL IDEA OF PARK PROTECTION

Prior to December 7, 1941, the most provoking question that could be addressed to a National Park Service man was, "What can there be for you to do in the winter?" Today park officials sometimes contend with a more serious question which reflects the same lack of understanding of national park objectives that prompted the pre-war question. Some citizens now ask, "What can there be for you to do in wartime?"

Both questions, of course, grow out of the rather popular supposition that the parks and monuments can be closed like theatres and left to themselves when the crowd goes home. To the thoughtful citizen it is quite obvious that they cannot be "closed." Problems of adequate care of these outdoor museums of science and history are always present. It is these problems of park protection, particularly, and the methods of meeting them that I wish to describe.

Principles of Administration

By way of beginning, a quick synopsis of national park objectives is in order. The fundamental ideal of park protection is expressed in the Act of August 25, 1916, creating the National Park Service—its lands are to be held "to conserve the scenery and natural and historic objects and wildlife therein, and to provide for the enjoyment thereof in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The reason for that policy, which was well established before the National Park Service was created and which has been affirmed repeatedly by acts of Congress, is found in the conviction that only by such conservation can the areas entrusted to the National Park Service fulfill the purposes for which they were established; they are to provide the highest and most deeply satisfying enjoyment that they are capable of yielding, and to promote popular understanding of the natural and historical processes which they exemplify.

As a means to that end, it is the responsibility of the Service first of all to acquaint itself fully with all that these public properties contain; to determine their significance and value and the uses to which they may be properly and safely put; and to utilize the most effective methods at its disposal, on the basis of this knowledge, to add to public understanding and enjoyment of them. Certain principles of administration have been defined which have been endorsed by many of the conservation organizations of the land. These principles might be elaborated upon to form a book-length dissertation but for present purposes it will suffice if I present a bare outline of the basic settled rules of action.

1. The national parks must be kept unimpaired for the use of future generations.
   a. No hunting.
   b. No logging.
   c. No grazing of cattle.
   d. No mining.
   e. No summer homes.
   f. No commercial developments except those required for the accommodation of visitors.

2. National interests must dictate establishment and use.
   a. Each national park is representative of a distinctive American feature.
   b. Local interests must not affect high standards in selection, acquisition, and use of areas.

3. Units in the Federal Park System are preserved for highest use by all people.
    a. To be made accessible to the public.
    b. Accommodations of all grades to be provided.
    c. Recreational development to be limited to natural facilities.
    d. Interpretation of park values of primary importance.

These principles were defined long ago, and since the early 1920's, at least, they have constituted a code of procedure for every park official. Even in normal times it has required vigilance to sustain the high ideals expressed in the code. Now, under the stress of war the number of hurried demands and misguided pleas for special privileges and general exploitation is greatly increased.

PROBLEMS CREATED BY WAR

What do citizens expect of the National Park Service during the war? The answer to that question comes to us in many and varied forms. Pressure groups prompted by selfish interests are most vocal, of course. The large majority in the great body of one-time park visitors are not organized and have no single mouthpiece, but, fortunately, they do find good representation in the scientific societies, historical associations, and conservation organizations of the nation. Nearly a thousand organized groups manifest interest in the affairs of the National Park Service. We welcome this interest and strive to respond to it in a personal way so far as it is possible to do so. Outside of the parks it is not possible to meet as many organized groups as we should like to meet because no extension service has been provided in our official program, but in the parks and monuments the Service officials personally meet millions of citizens through ranger activities and the programs of the park naturalists.

Restricted Travel

In 1941 some 21 million people had entered the parks and monuments prior to the fateful December 7. This was an all-time high in travel figures. Th declaration of war had an immedia effect upon visitor numbers, an through 1942 rationing, rubber shor age, and restrictions on recreation travel in common carriers brough about a decline in park travel. Som parks showed a drop of 80 per cen and it is impossible at this time to for tell what public use will be made the national parks in 1943. It is inte esting to note, however, that eve this diminished travel of 1942 w greater than the total national par travel for 1935.

So far as we know, recreational tr vel in 1943 will be permitted to u available space on regular schedule trains and busses. Restrictions o public and private transportation ge erally will limit long distance trav but there are indications that ther will be some civilian and militar travel to many of the national par and monuments, especially to thos areas within a reasonable distan of Army camps and large centers population and to those accessib by regular scheduled transportati lines. Anticipating this use, Servic officials and the operators of hote and lodges in the parks are now mak ing arrangements for limited servic that will be required by visitors.

Military Use

During the travel year, October 1941 to September 30, 1942, about million persons visited the variou units of the National Park Syste Included in the 1942 totals were ap proximately 900,000 members of th armed forces of the United States. Th use of the parks by soldiers and sailo has continued in 1943. The officers many Army camps and Naval statio located near national parks and mon ments have encouraged their men visit the areas. In some instances o ganized tours to national parks a featured as a part of the morale-build ing program of the military. For ex ample, Hobbs Air Field, located 1 miles from Carlsbad Caverns Nation Park, has perfected plans for sending least 1,000 soldiers each month to th Caverns. Arrangements have bee

made by the Merced (California) Flying School to send 500 men to Yosemite National Park each week. Of the 7,706 persons who visited Petersburg National Military Park in January 1943, only 475 were civilians. Whether the men come in small groups or as organized units they enter the parks without

On the Trail in Rocky Mountain National Park
(Courtesy of Union Pacific Railroad)

A prime duty of the National Park Service is to preserve the natural and historic values of the areas under its care. These values are fragile things. Problems in physical, geological, biological and historical sciences must be met and solved whether or not the parks find heavy use by visitors.

charge and the National Park Service makes every effort to extend to them a special service that will assist them in knowing and appreciating the natural and historic treasures contained in the areas.

At Manassas (Bull Run) National Battlefield Site the graduating classes of the Reserve Officers School of the Marine Corps, Quantico, Virginia, study the area as a part of their training. National Park Service officials lecture to these officer candidates on the two campaigns and battles of Bull Run. More than a thousand marines visit this area each month.

Civilian War Workers

Very recently, defense plants in California have organized vacation tours to the Sierra National Parks. The Lockheed plant and Consolidated Aircraft have sent several groups of 30 or more employees to Yosemite National Park to remain for two weeks, and additional similar groups are scheduled to spend their vacations in this manner.

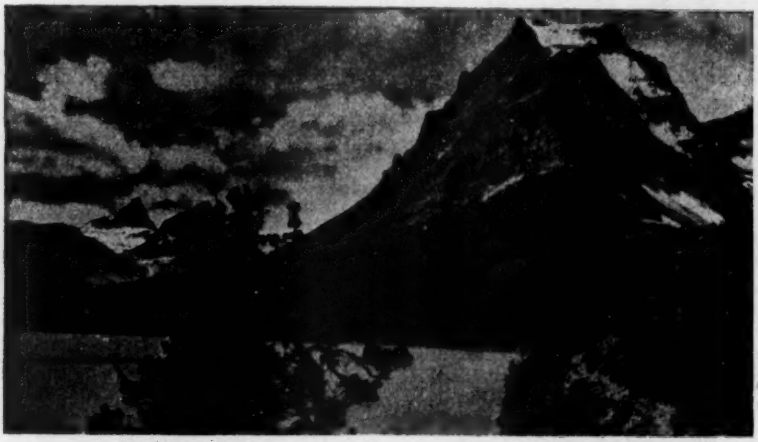
This use of national parks and monuments by the armed forces and war workers may seem incompatible with the nation's ban on pleasure travel, but, certainly, it is in harmony with the recreational needs of the military and the war production program.

Morale-building Function

Recently Joseph B. Eastman addressed the Allegheny Regional Advisory Board of Railroads, stating:

"Recreation under present conditions can be undertaken solely with the

purpose of building up body and mind and with the chief thought that this will help win the war. At the same time it has been proven beyond doubt that human beings cannot sustain continued and prolonged work for very long, without obtaining a proper balance between work on the one hand and vacations and recreation on the other."



St. Mary's Lake and Going-to-the-Sun Mountain, Glacier National Park
(Courtesy of Union Pacific Railroad)

The background of American character is reflected in the landscapes of the national parks, and the march of freedom in the United States is portrayed in the historical areas cared for by the National Park Service as shrines of culture and national progress. They are tangible symbols of democracy.

Mr. Ralph A. Bard, Assistant Secretary of the Navy, writing for the **New York World Telegram** on the subject of absenteeism, recommended a system of short vacations every 90 days as a help to the efficiency of war workers. Paul V. McNutt, War Manpower Commissioner, is reported to have endorsed the incentive vacation plan proposed by Assistant Secretary Bard. A month ago an official of O.D.T. stated in Chicago, "There is a definite need for civilian travel conservation; vacations as usual are not possible. We recognize that health and morale make some rest and relaxation necessary, but we urge that this be obtained with the minimum burden on transportation. We must minimize the peaking of loads on the carriers. There should be a spreading of vacations from now till the end of the year rather than during three months in the summer, and we repeat what has been said about traveling mid-week, avoiding trips on week-ends and holidays." The National Park Service does not encourage or advocate recreational travel but it is prepared to adjust its programs to meet the demands of those who find it possible to visit the parks and monuments.

There is always a morale-building value in national park use which may be particularly significant now. The battlefields of Yorktown and Gettysburg and the Statue of Liberty are wellsprings of patriotism. Pride in America swells in the hearts of all who look upon the mile-deep chasm of Grand Canyon, the geysers and hot springs of Yellowstone, the thundering waterfalls of Yosemite, and the towering Sequoias. One hundred and twenty-five million of our citizens have had such experiences during the past ten years. Consciously or unconsciously there has been built up within them an increased faith in our country. If public transportation had not been up-

set by the war demands for materials and facilities, the Service would, we believe, have been justified in encouraging extensive civilian use of the parks because of their morale-building values. The present use of parks by the military is definitely linked with the recreational and morale-building programs of the armed forces and it seems reasonable to conclude that national park experiences add to the conviction of these men that this is a country worth fighting for.

Maintenance Problem and Park Protection

Even if civilian Americans for the time being cannot visit their national parks, they gain courage from the fact that these possessions are being protected, and will be available to them after the war has been won. The wartime program of custodial work in the national parks and monuments recognizes this. Heavy investments have been made by the National Park Service in its physical plant. There are 167 areas in the Federal Park System comprising 22,000,000 acres. Upon these lands are physical developments conservatively valued at 215 million dollars. These investments will be protected; maintenance programs must continue whether or not the facilities find heavy public use. Even more important is the duty of preserving the natural and historic park values which are of fundamental importance in the American scene. These values are fragile things. Major problems in physical, geological, biological, and historical sciences are encountered and solved in preserving them.

The processes of nature impose many of these problems upon the park administrator, whether or not visitors are in the areas. Just now there is the necessity of protecting the natural and historic values from impairment that may be brought about by enthusiastic promoters of wartime use of park and monument resources. Most of the demands come from well-meaning citizens; others may be the culmination of planned raids. All must be studied and appraised. Some examples of these wartime problems follow.

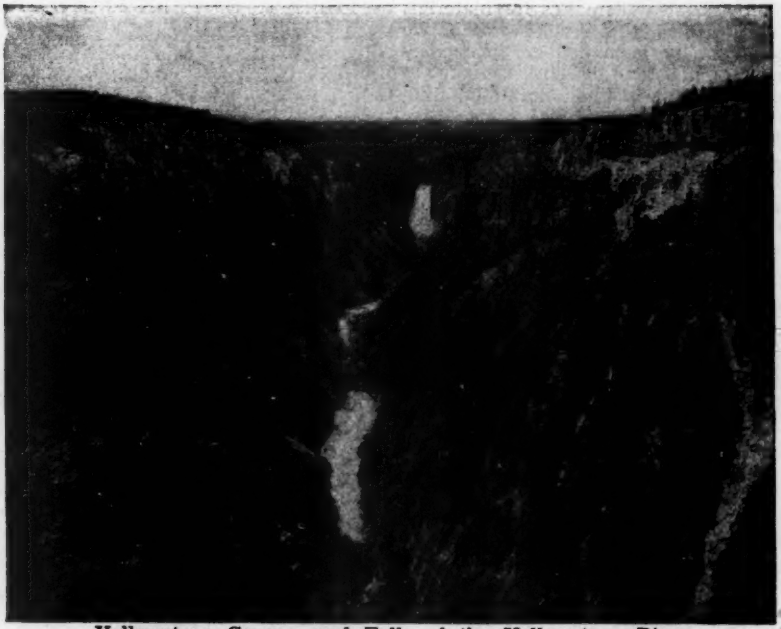
PROBLEMS OF PARK PROTECTION

Military Permits

Five hundred thirty-two permits have been granted to the armed forces and war agencies for operations and activities within the national parks and monuments. Had it been necessary for the War and Navy Departments to provide the lands and facilities made available by the National Park Service, not less than 30 million dollars would have been expended. Requests were analysed, investigated, and studied to determine what action should be taken to aid in the war program and at the same time protect park values. These permits have ranged from the installation of direction finders along the coastal areas to the complete assignment to the Army and Navy during the war of two national monuments — Fort Pulaski in Georgia and Cabrillo in California. The extent and nature of most of these permits of necessity are confidential, but it is interesting to note that the British Navy has made use of Recreational Demonstration Areas under the administration of the National Park Service in giving 10,000 battle-weary British sailors an opportunity to enjoy a change of scene, and the United States Army has utilized the National Park Service personnel in planning and constructing inexpensive rest camp facilities in areas which would be available to soldiers on leave. Thirty-three camps with a capacity of 20,000 men were constructed in 23 states and the District of Columbia. This rest camp program was launched before our entry into the war and is quite separate and distinct from the recreational use of national parks by the military mentioned previously.

Demands for National Park Service Timber

The shortage of Sitka spruce for airplane manufacture may be a threat to the safety of the virgin forests in Olympic National Park. This park serves its highest public use by preserving for future generations a remnant of the vast forests that once were the glory of the Pacific Northwest. Once mutilated, an outstanding natural spectacle



Yellowstone Canyon and Falls of the Yellowstone River
(Courtesy of Union Pacific Railroad)

For centuries Americans were so concerned with the exploitation of natural resources that little thought was given to preserving any remnants of them. Yellowstone became the first national park in 1872. Twenty years elapsed before other areas were recognized as worthy of similar preservation and yet another quarter of a century passed before a program of organized park protection under a National Park Service was instituted in 1916.

is lost to America forever. The consensus of conservation leaders is that none of the virgin forest in this park should be cut unless the trees are absolutely essential to the prosecution of the war. Logs from Oregon, Washington, Alaska and British Columbia are being made available, and the National Park Service is cooperating in the provision of airplane spruce by selling some of the timber in the Queets Corridor Parkway adjoining Olympic National Park.

It should be made clear that the areas in which cutting has been authorized are not within Olympic National Park. The Federal Government acquired a strip of land one-half to three-fourths of a mile wide on each side of the Queets River extending from the boundary of the park to the Quinault Indian Reservation, a distance of approximately 12 miles. An ocean strip somewhat over a mile in width was also acquired. This strip extends north from the Quinault Indian Reservation to the Ozette Indian Reservation. It follows the ocean shore for approximately fifty miles. Acquisition of these lands was a Public Works project undertaken for parkway and protective purposes.

The Western Log and Lumber Administrator of the War Production Board has recommended that selected Douglas fir and Sitka spruce of aircraft quality be made available from the Queets Corridor. The Secretary of the Interior in accordance with this request advertised this timber for sale in conjunction with a similar sale of timber on adjacent lands which belong to the University of Washington. One bid was received and the logging of 4

million feet of timber is now in progress. The contract of sale calls for selective cutting and a forest screen will be retained along the road right-of-way.

Urgent requests from tannin extract manufacturers for the surrender of dead chestnut on the Blue Ridge Parkway, and in the Great Smoky Mountains National Park have been received. In the case of the Blue Ridge Parkway, it was planned that most of the dead chestnut would ultimately be removed in landscaping and hazard reduction measures. It seems advisable to make this wood available now in view of the demands for easily accessible supplies of chestnut. The Peaks of Otter area is to be used for a trial sale if bids are obtained. The National Park Service adheres to the opinion that such cutting within the national parks must be avoided except as a last resort in case the need for dead chestnut for tannin extract becomes an acute war necessity which cannot be met from the supplies elsewhere. According to the best information available at this time, such a contingency does not appear imminent.

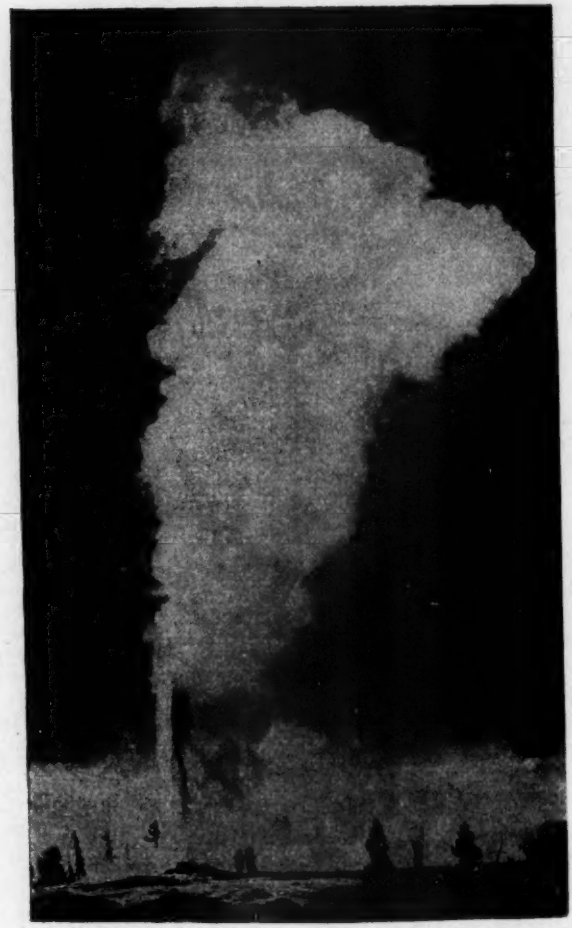
Requests for Mineral Resources

Similarly with proposals to mine strategic minerals in the national parks and monuments, the position has been taken that invasion of a national park by mining can be justified only to furnish strategic or critical minerals indispensable to the war and not obtainable elsewhere. In general, studies indicate that strategic minerals are not present in national park areas in sufficient quantities to be of economic importance, but the Service in collaboration with the Geological Survey is prepared to aid in determination of the nation's highest interest in the matter of sacrifices necessary to provide war materials. Any developments that may be adjudged necessary will be undertaken by the Government and no financial benefits will accrue to individuals or other private interests.

In May 1942, the Secretary of the Interior authorized the Defense Plant Corporation to extract salt from Death Valley National Monument for a period of three months, for use in the production of magnesium at the Las Vegas, Nev., plant. The permit was given with the understanding that the operating company, Basic Magnesium, Inc., would develop a suitable supply of salt elsewhere as soon as possible. By August 9, about 18,000 tons of salt had been extracted when the operation was halted by a cloudburst which washed out the roads. The roads were repaired and the permit extended but no salt has been taken from the national monument since the interruption in August. Suitable salt supplies have been located elsewhere and there will be no occasion for renewed salt mining in Death Valley. In some degree the natural landscape features of the national monument were impaired by this operation, but it is hoped that Nature will restore the salt pinnacles that were leveled by the mining operation.

Another case of National Park Service mineral resources required by the war production program is found in Yosemite National Park where a deposit of tungsten was found in the high country on the north boundary of the area. A study of the deposit was conducted last August by the Geological Survey, at the request of the National Park Service. The deposit is relatively small but of high grade. Upon the advice of the War Production Board, arrangements have been made with the Metals Reserve Company to extract the ore of this critically scarce mineral as soon as weather conditions will permit.

Prospectors and other local interests have pressed several other claims for the exploitation of minerals in National Park Service areas but most of the deposits have proved to be of no importance to the war program. Reported occurrences of copper in Grand Canyon and Mt. Rainier National Parks were demonstrated to be of negligible value. The same appraisal was given to a manganese deposit in Shenandoah National Park. Discoveries of manganese in Boulder Dam Recreational Area, however, prove to be important and the deposits will be mined for the Government. Thirty-eight thousand yards of gravel and stone were removed from Sitka National Monument for military



Old Faithful Geyser, Yellowstone National Park
(Courtesy of Union Pacific Railroad)

The "living museum" exhibits of the national parks constitute basic values which exceed their playground qualities. In the master plan of each park and monument appears a concise statement of those features or values which distinguish the area. The inventory, or interpretive statement is more than a listing of principal features; it is an analysis of the record of inspirational and recreational experiences enjoyed by visitors. These analyses point to the fact that the important values of the National Park System are found in its capacity to stimulate pride in and understanding of our natural heritage and cultural tradition.

purposes. Molybdenum reported to occur in Sequoia National Park is to be investigated.

Glacier Bay National Monument and Mt. McKinley National Park, Alaska, Death Valley National Monument, California, the northern and eastern portions of Olympic National Park, Washington, and Organ Pipe Cactus National Monument, Arizona, are subject to the mining laws of the United States with certain surface restrictions under Departmental regulation. The Geological Survey has conducted a search for strategic and critical minerals in some of these areas during the past several years. All other areas in the National Park System are closed to prospecting and mining in accordance with the mandate of Congress. Recognizing its primary responsibility to protect the parks and monuments from exploitation, the Service has, nevertheless, also recognized its duty to maintain a cooperative attitude towards proposals to utilize the natural resources of the parks for war purposes. Each proposal for mining is given careful study to determine whether it is in the public interest to draw upon the resource involved and to ascertain if the necessities of war require that the sacrifice be made.

Stockgrowers' Interest in National Park Service Range Lands

In ten national parks and thirty-three national monuments and other Service areas, the grazing of livestock was permitted when the areas were established and continues to be tolerated by the National Park Service under authority extended by the Congress to the Secretary of the Interior. Some 19,893 head of cattle and 74,097 sheep fed upon the ranges opened to them by the National Park Service in 1942. Approximately 1,300,000 acres of Service lands are affected by these permits—less than one-seventh of one percent of all the lands grazed in the United States. To the comparatively few stockgrowers who have established their business enterprises in the neighborhood of Service areas the availability of Service grazing land looms big in the economic scheme. To the rest of the nation, this grazing in national parks and monuments is relatively unimportant economically, however the present demand for increased meat production has caused the United States Government to study the grazing potentialities of even minor units. The livestock industry, always alert to advance its interests, has opened its campaign to expand grazing in certain national parks where grazing now is permitted and to gain access to certain other parks and monuments where grazing has been excluded.

Recently, the National Park Service has made a careful investigation of all grazing potentialities of the lands under its jurisdiction. This inventory of range resources was made in connection with a survey conducted by the Department of the Interior to determine what contributions can be made to the nation's food and fiber supply. The study produced statistics on National Park Service range resources which cause the Service to reaffirm its long-standing policy of eventual elimination of all grazing by cattle and sheep from the scenic-scientific areas under its administration. There will be no departure from the established principle that the great scenic parks and other important natural areas shall be held inviolate, but on certain types of areas opportunity exists to increase grazing during the emergency. In Great Smoky Mountains National Park and in Gettysburg and Lava Beds National Monuments an increase in the number of animals now on the range may be permitted, but no extension of the areas grazed will be involved. In Carlsbad Caverns and Shenandoah National Parks and in six national monuments, one national historic park, one national recreational area, one national historical site, two national parkways, and three recreational demonstration areas extension of grazing to ranges not previously used, as well as an increase in the number of animals now grazed on existing ranges may be permitted. This extension and expansion may result in a 20 per cent increase in the number of cattle grazed and a 10 per cent increase in the number of sheep. However, the number of animals involved (cattle—20,000 increased to 25,000, and sheep—74,000 increased to 82,600) is very small when contrasted

with the total volume of business engaged in by the American stock industry. It is worthy of note that the goal of the Grazing Service of the Department of the Interior in serving the nation's food-for-war program is to obtain a 10 per cent increase in stocking cattle and sheep on the Federal range. Judged on the basis of the proposals of the Grazing Service, the possible increases in National Park Service grazing activities should be accepted as adequate, but the Service cannot dismiss the problem as solved. Pressing demands for grazing privileges affecting areas that should be held inviolate are being made by stockmen and their lobby. The situation may involve a crucial test of the national park idea. Conservationists, generally, should be informed regarding the menace.

Effects of Grazing. A few of the damaging effects of grazing in national parks and monuments may be mentioned here:

(1.) Injury to scenic and esthetic values. Grazing of livestock destroys the very wilderness character by which many of the national parks and monuments are distinguished. These areas are preeminent among the few virgin reservations in the country and they serve as check plots and research areas for biological research workers as well as outdoor laboratories for a growing number of students and nature lovers. Grazing injures, even eliminates in some instances, many flowering plants or other botanical features of high scientific and esthetic value. The lush mountain meadows of the scenic parks often are the most sensitive spots, and after a few years of intensive grazing may become barren wastes. Unsightly gullies develop and soon the forces of erosion have wrought irreparable damage.

(2.) Damage to historical and archeological values. During recent years the National Park Service has made determined effort to stabilize the hundreds of important historic and prehistoric structures and ruins that are found within its areas. The purpose of this work has been to arrest the destructive effects of weathering and erosion. Domestic livestock, given access to these areas of cultural significance, may in a few minutes do more harm to ruins, sites, markers and inscriptions than would the forces of nature in a human lifetime.

(3.) Effects upon biological relationships. It is obvious that heavy grazing brings about drastic ecological changes and if long continued notably alters the biota of the area grazed. If stock have access to virgin lands too early in the season or if the number of grazing animals is too great, normal growth of certain plants is prevented, the vigor and nutritive value of the more palatable species are reduced and eventually the original good forage may be replaced by the poisonous plants and unpalatable species which are not taken by the stock. The destructive effects of trampling affect the sod or other ground cover, opening the way to stream cutting, gulley formation and the removal of top soil. The water table is lowered and moisture-loving plant species find themselves without sustenance. The subsequent drying out of the soil invites the establishment of lodgepole pine seedlings or other species foreign to the original plant assemblage, and in a comparatively few years the primitive biological picture has been obliterated. Destruction of the plant species has immediate effect upon the animal population. Browsing and grazing members of the fauna are deprived of their sustenance which, in turn, affects the flesh eaters. Increased siltation of the streams modifies the aquatic fauna and flora including the fish resources. Wildlife watering holes are polluted or otherwise rendered unfit for use. Not the least important among the damaging results of grazing is the introduction or extension of the diseases of domestic stock among certain native species. Stock-carried exotic plants add to the menace.

(4.) Depreciation of general recreational values. The nuisance element and the accompanying unsightly effects resulting from the presence of cattle in campgrounds and other areas of intensive human use give emphasis to the incompatibility of grazing and recreational use. Pollution of bathing areas and domestic water supplies are accompanying ills. The use of the "back country" by park visitors is encouraged by the service. This use calls for pack

animals and saddle horses. In many high country meadows the forage for "recreational stock" is already taxed to its full capacity and cannot stand the added strain of cattle grazing.

(5.) Damage to park structures and other physical developments. Cattle free to range through the national parks and monuments bring about a very rapid deterioration of roads, road slopes and trails. They damage the facilities provided in campground and break down fences. Landscaping developments at headquarters areas and around residences are sometimes destroyed or damaged.

Is grazing in national parks vital to national welfare? The Secretary of the Interior has reaffirmed the ever strengthening policy of eliminating grazing from the national parks and monuments. It is the conviction of the National Park Service that the people of this Nation desire to retain the national parks in their natural condition. Further extension of grazing, therefore, will be prohibited unless and until this war makes grazing in these areas vital to the national welfare. If that time comes, the people will know that there is no alternative and that the sacrifice will have to be made in aid of winning the war.

On March 3 a noted news analyst in a radio broadcast interviewed the owner of a 40,000 acre cattle ranch in Oklahoma. The rancher stated that ordinarily at this time of year he has 8,000 cattle on his lands. This year, due to the difficulties of obtaining stock to be fattened, only 5,000 head are grazing where 8,000 could be fed. If this one ranch could be brought up to full production, it would take care of a notable share of the increase of grazing animals that some cattlemen believe should be admitted to the western national parks. If similar conditions exist on other cattle ranches, it seems obvious that the time has not come when it is necessary to invade the grazing lands of the national parks in order that the war may be won.

BASIC VALUES OF THE NATIONAL PARKS

For centuries Americans were so concerned with the exploitation of natural resources that little thought was given to preserving any remnants of them. Neither sentiment, thrift, nor scientific approach influenced this selfish utilization. Finally the nation awakened to the realization that its successful exploiters had displayed no great vision.

True conservation programs, with a few exceptions, had their beginnings during the lifetime of most of us present here, so recently have we come to look back upon primitive America as something to be cherished. The preservation of primitive areas had its beginning in America when in 1864 a few far-seeing Californians obtained Federal action in reserving Yosemite Valley and the Mariposa Grove of Big Trees as a State park. Yellowstone became the first national park in 1872. Twenty years elapsed before other areas were recognized as worthy of similar preservation, and yet another quarter of a century passed before a program of organized park protection under a National Park Service was instituted in 1916.

The infant bureau of parks weathered the stormy years of the first World War and emerged thereafter with a defined policy of administration. The basic rules of management were developed then and have proved to be dependable in translating policy into intelligent administrative action. In the years that followed World War I the interest of Americans focused upon the national parks and monuments especially as vacation spots, and—as I have already indicated—in some of them the recreational use has taxed all facilities. To a multitude of vacationists the parks have become known as "the pleasuring grounds of America."

It is obvious that the parks and monuments have a basic value that far exceeds their playground qualities. In order that the National Park Service might appraise park values and review Service functions it has prepared an inventory of assets as they relate to

public use. In the master plan of each park and monument appears a concise statement of those features or values which distinguish the area. The inventory, or "interpretive statement" is more than a listing of principal features; it is an analysis of the record of inspirational and recreational experiences enjoyed by visitors. These analyses point to the fact that the important values of the National Park System are found in its capacity to stimulate national pride in and understanding of our natural heritage and cultural tradition; they high-light the fact that the significant use of the so-called "pleasuring-grounds of the people" embodies much that the nation is fighting for in the present war for liberty, and they emphasize the necessity of active guardianship on the part of all conservationists. National park champions must accept responsibilities to coming generations. They cannot compromise in their leadership in order to gain doubtful advantages. During the ordeal of all-out warfare the National Park Service more than ever before needs the help of conservationists. The Service functions as trustee, not as landlord. Conservation organizations must play a role in the exercise of that trusteeship. Their thought must contribute now to the guidance that is so necessary to the intelligent weighing of national values.

The very background of American character is reflected in the landscapes of the national parks, and the march of freedom in the United States is vividly portrayed in the historic areas cared for by the Service as shrines of culture and national progress. They are tangible symbols of democracy and they must not be sacrificed, even in part, until it is shown that their material resources are essential to victory.

THE BENEFITS AND DANGERS OF OUR NATURAL HERITAGE

EDSON S. BASTIN
Department of Geology and Paleontology, The University of Chicago

At a time when so many of our natural resources are strictly controlled by rationing and other restrictive measures it is of interest to consider some of the causes that make such control necessary and to inquire whether all restriction can safely be abandoned when the war is over.

From the human standpoint the plant and animal resources are the most important, for on them man is dependent for the most fundamental necessities of life—food and clothing. Throughout most of human history they have been man's only resources. Because resources of this sort are renewable year after year or generation after generation, because they can be moved from one part of the world and made to flourish in another, and because they can be improved by plant and animal breeding, they present on the whole less serious economic problems than the mineral resources.

Our mineral resources are **not** renewable. The few that are increasing today are forming at a rate so slow as to be of no consequence in terms of human needs. They cannot be transplanted to grow in new environments. They are exhaustible—in fact, many of them have already been exhausted—the gold and silver of Mark Twain's Virginia City in Nevada, and most of the silver and the oil of Old Mexico. Yet it is the mineral resources that peculiarly give character to modern life and stamp it as radically different from life in the days of Washington or even Lincoln. Eighty-four percent of the freight carried on our railroads in 1940 was a product either crude or fabricated of our mines and quarries, and this freight was carried mainly in steel and hauled by steel locomotives powered by mineral fuels.

With the comforts and other benefits that mineral resources have brought us have come also perplexing and often dangerous difficulties for nature has distributed the mineral resources very unevenly over the globe, and man has drawn his political boundaries with little regard to that distribution.

Mineral resources have played an important rôle during the past seventy years in wars and less serious international disputes, and in the present war the many and varied methods applied for the control of mineral resources serve to etch into relief their great significance in world affairs. Domestic adjustments have included the feverish search for new deposits and the accelerated development of old ones, restriction of consumption to uses that are essential, the use of substitute mineral resources, and the development by the chemist of synthetic products to take the place of natural resources. Foreign arrangements with a view to insuring adequate mineral supplies have included military conquest—the favorite method of the Axis powers, military alliances, economic pressure, purchase of unneeded supplies to prevent them from falling into enemy hands, the accumulation of stock piles, exploration and development of foreign deposits to augment domestic supplies, lend-lease aid and the removal of tariff and other trade barriers between friendly nations.

What philosophy shall we build up with respect to natural resources in anticipation of the return of peace? Certainly a better philosophy must be found than the Axis philosophy of self-sufficiency through conquest, if we are to pull up by the roots the causes of this war and the potential causes of future wars. Our philosophy

must not be for ourselves alone for the problems of natural resources are global in extent and they must be met by policies global in their scope.

A philosophy for the peaceful development of the world's resources for the benefit, not of a few countries but of all, must face in exactly the opposite direction from the Axis policy of self-sufficiency by conquest. It must recognize in the natural haphazard distribution of resources and particularly of mineral resources, nature's solemn mandate that this wealth is for the world—not merely for the stronger nations. It must recognize that not even the country in which these resources occur, has exclusive rights to them but instead is their trustee, obligated to share with other countries either the resources themselves or the products made with their aid.

If for the future we must erect guiding principles to combat and to replace those that have wrought so much harm, it is equally essential that these principles be translated into action through procedures planned with the utmost care. There will be no simple formulae for such procedures because different problems will have to be met in different ways. The principle of trusteeship implies easy access to raw materials, and this means open doors and lowered trade barriers. Between the two World Wars restrictive measures rather than the removal of barriers was the rule, with disastrous results. The war powers granted to our President to lower trade barriers between allied countries is perhaps illustrative of what may be necessary on a wider scale after the war, though such adjustments probably should not be inflexibly applied.

In such political units as the United States and the British Empire, which possess abundant raw materials and highly developed industries, great pressure may be expected to restore old trade barriers or to erect new ones after the war. It is these very countries, however, that will have to take the initiative, if a new economy of natural resources is to be established. From us and from our British allies will have to come the will to fight reactionary policies with fearless courage, the vision to initiate equitable methods for the distribution of natural resources and the cooperative spirit that will draw all other nations as promptly as possible into such efforts for the common welfare. The rewards of such efforts will be inestimably great in terms of international good will and world security.

The problems of raw materials will be particularly urgent and difficult when the war controls under which most of the world's commerce is now conducted, are suddenly removed and the needs of rehabilitation and relief become acute. Some international agency for economic control should be ready to function constructively in that emergency and to forestall a return either to dangerous restrictive measures or to the equally dangerous policy of **laissez faire.** The functions of such a body should, however, be permanent and should be continuously applied to the great and ever-changing task of adjusting world resources to world requirements.

MEMOIRS

WILLIAM SHIRLEY BAYLEY*

1861-1943

When the late William Shirley Bayley, Professor of Geology, Emeritus, University of Illinois, graduated from the Male High School of the City of Baltimore at the age of seventeen, he was the recipient of a prize given by the Peabody Institute of the City of Baltimore "for fidelity to his studies and attainment therein, for correct moral deportment and personal habits, and for propriety of manners". A more accurate characterization of him could scarcely be written now. Some elaboration of his life, however, is quite appropriate.

He was born in Baltimore, Maryland, November 10, 1861, the son of Robert P. and Emma Downing Bayley. On his father's side the family was of old Irish ancestory, and resided at Crossharm, Ireland. On his mother's side, the family was English dating back to Stephen Williams of Great Yarmouth, County Norfolk, in the 16th century. In 1637, Robert Williams, of the eighth generation removed, emigrated to Massachusetts, and subsequent members of his lineage filled places of trust and distinction in colonial affairs.

From high school young Bayley entered the Johns Hopkins University with a view to becoming a chemist but he found increasing interest in the new and growing science of geology which offered opportunities for young men in both the field and the research laboratory. One time he tried to help his father out in his business of importing china, when his father was stricken with paralysis, but business life did not appeal to him and he returned to his studies. Receiving his A.B. in 1883 he continued his post-graduate studies, was awarded a fellowship in 1885-86, and received his Ph.D. degree in 1886.

William Shirley Bayley

From 1888 to 1904 he served as Professor of Geology at Colby College where his popularity as a teacher and his devotion to research made him an inspiring faculty man. Among his students was the young George Otis Smith, who later became Director of the U. S. Geological Survey. In tribute to Professor Bayley's teaching, Dr. Smith relates in the March 1942 issue of the Colby Alumnus that in a Johns Hopkins laboratory in the course of his graduate work, a debate among the graduate students was closed by one of them remarking: "It isn't that 'G.O.' learned more geology in college than we did, but he didn't learn so much that wasn't so."

After teaching two years at Lehigh University, Professor Bayley was invited by President Edmund Janes James to come to the University of Illinois in 1906 where, from Assistant Professor of Mineralogy and Economic Geology

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he rose to Professor of Geology in 1913 and Head of the Department in 1928, in which capacity he served until his retirement in 1931 with the designation of Professor Emeritus, thus completing twenty-four years of highly creditable service to the University. As a junior member of the Department from 1919 to 1923, the present writer came to recognize his thorough-going teaching and his challenging attitude toward his students in stimulating their devotion to the highest ideals of science. Twenty years more of association with him personally and professionally made indelible these impressions of his critical guardianship of science.

But Professor Bayley was not only a teacher and a critic. He was a research investigator and writer of great merit. For many years he devoted his summers to intensive field work. Establishing an early connection with the U. S. Geological Survey as assistant geologist and later as geologist he did a great deal of work on the pre-Cambrian rocks and iron ores of the Lake Superior region in northeastern Minnesota and in northern Michigan. Many articles came from this work as it progressed, nine of them within six years, besides a continued series of five articles on the basic massive rocks of the Lake Superior region. Then came two extensive reports as junior author with Professor C. R. Van Hise on the Marquette iron-bearing district of Michigan in 1895 and 1897 and a monograph under his own authorship on the Menominee iron-bearing district of Michigan in 1904, besides more papers of increasing significance, including one on the water resources of Maine and two geologic atlases of areas in Michigan and New Jersey, which were in joint authorship with Van Hise and N. H. Darton, respectively. Seven other notable publications punctuated a total of forty-one scientific entries, ninety-seven book reviews and three text-books in his labor-won bibliography. The scope of his work embraced mineralogy, petrography, areal geology, underground waters, economic geology, metalliferous deposits, clays, and the history of geology, which was in widely distributed areas—Maine, New York, New Jersey, Birmingham, North Carolina, Tennessee, Georgia, Texas, Minnesota, Michigan, and Canada. He was also connected at one time or another with the state geological surveys of New Jersey, North Carolina, and Tennessee.

Some of his life's energies were also devoted to certain scientific journals, for he was associate editor of American Naturalist, 1886-87, reviewer for Neues Jahrbuch fur Mineralogie, Berlin, 1890-1908; and business editor of the Journal of Economic Geology, 1905-42. He was honored by being made councilor of the Mineralogical Society of America, 1931-34, and its president in 1936; councilor of the Geological Society of America in 1919 and 1937, and a vice-president in 1936; and councillor of the Society of Economic Geologists, 1925-27, and vice-president in 1932. He was also faithful to promoting interest in science in his state of adoption and was honored with the presidency of the Illinois Academy of Science in 1922-23, during which office he sponsored the organization of a Junior Academy of Science for high school students. He was always solicitous in safeguarding the educational interests and standards of the University of Illinois and served on important and influential committees. In recognition of Professor Bayley's scientific attainments and of his devotion to his alma mater he was selected by the Johns Hopkins University as a representative of its scientific alumni on the occasion of the celebration in 1927 of its fiftieth anniversary.

Although his death on February 13, 1943, is a real loss to science, all of us who knew him well and the many who knew only his work must feel a deep sense of gratification and inspiration in a life so full, so exemplary, and so richly productive.

M. M. LEIGHTON

CHARLES JOSEPH CHAMBERLAIN

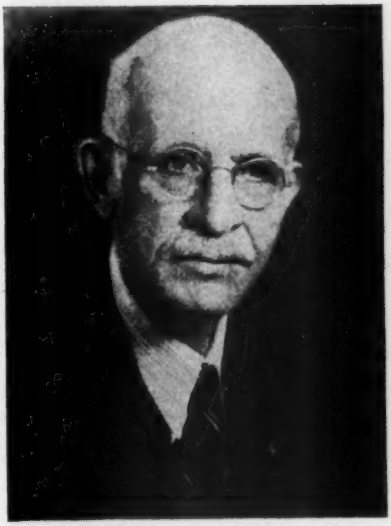
1863—1943

Professor Chamberlain died on January 5, 1943 at his home in Chicago after a short illness. His passing marks the passing of the last of those who pioneered in establishing the Department of Botany at the University of Chicago.

Charles Joseph Champerlain was born February 23, 1863 on a farm at Sullivan, Ohio, where he spent much of his boyhood. As he had joined a country band he decided to be a musician and as a preparation for the Oberlin Conservatory, he entered Oberlin High School in 1881. Upon graduation, however, he proceeded with the classical course at Oberlin College, receiving the A.B. degree in 1888. After teaching for a time in high schools, he entered the recently organized University of Chicago in 1893. Before receiving the Doctor's degree in 1897, he became Assistant in Botany and remained connected with the Department of Botany until his death. He was made Professor of Plant Morphology and Cytology in 1915 and Professor Emeritus of Botany in 1929. During 1901-02 he studied with Professor Strasburger at the University of Bonn, Germany. In 1923 Oberlin College conferred on him the degree of Doctor of Science and he was an honorary member of many European botanical societies.

A fellow of A.A.A.S. in 1923 he was Vice President and Chairman of the Botanical Section of that Society, and in 1931 he was President of the Botanical Society of America. He was also a Life Member of the Illinois Academy of Science. For many years he was American editor for Botanisches Zentralblatt and an Associate Editor of the Botanical Gazette.

His best known book is "Methods in Plant Histology", still the standard text of its kind, which first appeared in 1901 and was revised through five editions to 1932. His "Elements of Plant Science" (1930) has been translated into Spanish at Buenos Aires, and his other books include "The Living Cycads" (1919), and his monograph on the Cycads was unfinished at his death. In collaboration with Proffesor John M. Coulter he also wrote a series of morphologies of the seed plants.



Charles Joseph Chamberlain

His Botanical researches were very numerous especially among the cycads. He made four trips to Mexico which resulted in the discovery of many new localities in which cycads grow. For the same reason he visited Cuba in 1914 and again in 1922. His longest excursion for these remarkable plants was in 1911-12 to New Zealand, Australia and South Africa. Collections resulting from these travels have given to the University of Chicago the most extensive and complete assemblage of these plants ever brought together.

Not only his family, but his wide circle of friends and colleagues, will miss him. His former students, now found in Universities and research institutions throughout the world, gratefully remember his kindly but critical advice. His passing is a deep personal loss to all of us.

GEORGE D. FULLER

WILLIAM ALBERT NOYES*

1857-1941

William Albert Noyes was born in the country near Independence, Iowa, November 6, 1857. His family, of New England Congregational stock, lived under pioneer conditions not favorable to the study of chemistry and physics; nevertheless as a boy he managed to get hold of some scientific books and became interested in these subjects at an early age. He studied at Grinnell College and graduated with A.B. and B.S. degrees in four years in spite of teaching school each winter to pay expenses. Much of his graduate work at Johns Hopkins University was done while carrying a full teaching load and he received his doctor's degree in chemistry before reaching the age of twenty-five.

Such unremitting labor was characteristic of Dr. Noyes throughout his long life. During a year as instructor at the University of Minnesota he performed much analytical work for the State Geology Survey (just as he did later in Indiana) and began original research of his own. The research was continued at the University of Tennessee, where he was professor from 1883 to 1886. A seventeen-year period followed at Rose Polytechnic Institute, a small school of high grade. In spite of a heavy teaching load, he attracted the attention of the chemical world by his researches and his books.

From Rose he stepped in 1903 to the position of chief chemist of the Bureau of Standards (the first to hold that title), and from there to head of the department of chemistry of the University of Illinois, where he served with distinction from 1907 to 1926, becoming then professor emeritus.

His pathway has been strewn with well-deserved honors; presidency of the Indiana Academy of Science (1894), vice-presidency of the American Association for the Advancement of Science (1896), presidency of the American Chemical Society (1920); degrees from Clark in 1909, Pittsburg in 1920, and Grinnell (his alma mater) in 1929; memberships in the American Academy of Arts and Sciences, the National Academy of Sciences, the American Philosophical Society; the Nichols medal (1908), the Willard Gibbs medal (1920), the Priestley medal (1935).

He was secretary of the American Chemical Society from 1903 to 1907, editor of the **Journal of the American Chemical Society** from 1902 to 1917, editor of **Chemical Abstracts** from its beginning in 1907, to 1909, editor of **Chemical Reviews** from 1924 to 1926, and editor of the Scientific Series of American Chemical Society Monographs from 1919 to the time of his death. Since 1917 he had been secretary of the Illinois State Board of Natural Resources and Conservation.

His personal character is a key to all that he accomplished. One would judge from his life that genius is fine intellect with capacity for a tremendous amount of hard work. He was first of all a scientific thinker, less affected than most by emotion or selfish bias, and utterly unassuming. He was a hard, persistent fighter for whatever he thought was right, and he was right most of the time. Unusual patience, earnestness, and the force of example contributed to his success as a teacher. The fabric of Dr. Noyes' achievements was shot through with loyal friendships and strong humanitarian sympathies. Perhaps his deepest interest was religion—a liberal faith which he felt to be in harmony with scientific truth and at the same time a vital faith, something to be lived.

* Excerpts from Science, N. S.; Vol. 94, No. 2447, Nov. 21, 1941.

HERMAN SILAS PEPOON

1860 - 1942

Thousands of students have enjoyed and profited by contact with Dr. Pepoon. He transformed any group, almost immediately, into one of thoughtful, good natured spirit. Born January 21, 1860 of George W. and Mary (Abbey) Pepoon, he graduated from the University of Illinois with the class of 1881, and two years later graduated in medicine. Later he married Alma A. Wilcox of Chicago (died 1893), and to this union were born his three children, Rudolph S., Lucile (nurse, died in France during first World War), and Mrs. L. Constance Buckley. He married Helen S. Foberg in 1900 (died 1931).

Dr. Pepoon's great love for young people and for their association led him to leave the work of practising physician in 1892 and become a teacher. He had carried on as a physician in Nebraska and in Lewistown, Illinois for eight years. Joining the faculty of Lake View High School, Chicago, he continued as teacher of boys and girls, first of all, as well as the biological sciences.

He was a life member of the Illinois Academy of Science, in which he was very active for many years. During this time, he was chairman of the botany section, vice-president (1914) and treasurer during 1916 and 1917. Among the numerous papers delivered at meetings of the State Academy are the following: "Cliff Flora of Jo Daviess County," in vol. II, 1909; "The Forest Associations of Northwestern Illinois," vol. III, 1900; "The Primrose Rocks of Illinois," vol. X, 1917, and "Peculiar Plant Distribution," vol. IX, 1916. During his most active years in the Illinois Academy of Science work, he was member of the Committee on Conservation of Wild Life 1918-1919, member of Committee on Ecological Survey 1914, 1921-1922, and of the High School Science Clubs committee, 1920-1921.

Among the important clubs he organized and led should be mentioned the Chicago Nature Study Club. In groups of from 20 to 200 he conducted the members on field trips throughout the Chicago area. During these years he

Herman Silas Pepoon

accumulated much of the information which he later brought together in that classic publication of the Chicago Academy of Sciences, "The Flora of the Chicago Region."

Among the major interests, throughout his life, was the preservation of Apple River Canyon as a state park. In this region he spent much of his boyhood and here developed a lifelong love for botany. On the walls of the Apple River Canyon he found an unusual plant, the dwarf Canadian primrose, **Primula mistassinica** Michx.

In the later years of his life, he travelled throughout the state recording and cataloging plants for the Illinois Natural History Survey.

In his every undertaking, constant devotion and untiring energy were his priceless contributions. This he combined with the ability to inspire his co-worker to great industry by a deep and lasting interest in every detail of each project.

VERNE O. GRAHAM

HARRIET S. STRONG

1880 - 1942

Harriet S. Strong, was born to Francis S. Strong and Hannah Perkins Strong in Downers Grove on November 5, 1880. Their farm was part of a thousand acre tract of land that had been homesteaded in 1836 by Eliphalet Strong and Horace Dodge. Harriet's mother was a devoted student of nature and possessed an inexhaustible supply of nature lore. She was educated in early academies of the east and taught in private and public schools for several years prior to coming west. Hannah Strong arrived in Downers Grove, Illinois, in 1869, coming west to visit her aunt Mrs. Eliphalet Strong. Here she met her husband, who was a step son of her aunt. Harriet wrote of her mother "she had one outstanding trait, a sweet and simple trust in God." This trait was inherited by her daughters.

Harriet had three main traits,—a beautiful Christian faith, a love of history and books, and an understanding of the subjects to which she dedicated her life, botany, biology, and English. She prepared for college in local schools, and in 1905 was graduated from Northwestern University. Later she received her master's degree from that university. She spent many years teaching in Ohio, Indiana, Michigan, and other places. She also taught at Wheaton College and at North Central College at Naperville. Her travels took her to many parts of the United States and included a trip to Europe and Palestine. These experiences gave her a background for writing and she became a contributor to many newspapers and magazines. Only a few of her best friends knew of her poetry which embodied understanding interpretations of nature's secrets.

Harriet was always interested in civic affairs, and spent much time in service to her church and community. She especially emphasized the fact that women had a contribution to make in the planning and growth of the new America. She served as president of the local League of Women Voters, and her interest and work were extended to the state program. She was very active in the program of the Downers Grove Woman's Club, serving as chairman of the art and literature committee for years.

Her training and environment gave her an interest in research, and she made a life study of wild flowers and weeds. One of her outstanding poems was entitled "Grasses". She had a unique theory that Nature was a great experimenter, always busy extending and completing her work. During her later years she planned a wild flower garden at home where she spent many hours watching her plants and charting their development. Her favorite recreation was visiting the woods and studying plants in their natural habitat. One of her contributions to the local newspaper was called "God's Experimental Gardens".

Harriet passed away October 6, 1942. She had enriched the lives of many children in Downers Grove by taking them for trips in the forest preserve and to the arboretum and Lyman woods, with which she was very familiar. She inspired every one she knew with an interest in the conservation of wild life and the study of wild flowers, birds, and animals. Downers Grove had reason to be proud of Harriet and there were many to mourn her loss. She and her sister Elizabeth with whom she lived had spent many hours in their own garden as well as in the woods which surrounded the village of Downers Grove.

ALICE M. PAINE